UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/888,890	06/25/2001	Patrick A. Harkin	4586US (00-0747)	1176

24247   7590   06/05/2003

TRASK BRITT
P.O. BOX 2550
SALT LAKE CITY, UT   84110

EXAMINER
CASCHERA, ANTONIO A

ART UNIT	PAPER NUMBER
2697	

DATE MAILED: 06/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

	Application No.	Applicant(s)
Office Action Summary	09/888,890	HARKIN, PATRICK A.
	Examiner	Art Unit	
	Antonio A Caschera	2697	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**.　　2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-68_ is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-38,40-47,49-55,57,59-66 and 68_ is/are rejected.

7)☒ Claim(s) _39,48,56,58 and 67_ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _31 August 2001_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

　　If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☐ All b)☐ Some * c)☐ None of:

　　　　1.☐ Certified copies of the priority documents have been received.

　　　　2.☐ Certified copies of the priority documents have been received in Application No. _____ .

　　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

　　a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _2_ .
4)☐ Interview Summary (PTO-413) Paper No(s). _____ .
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____ .

DETAILED ACTION

Claim Objections

1.   Claim 1 is objected to because of the following informalities:

    a.   The phrase, "...one polygon of at least a portion the digital object," should read,

"...one polygon of at least a portion of the digital object," (see lines 1-3 of claim 1).

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1-34, 49, 50, 53-55 and 57 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Takeda et al. (U.S. Patent 5,748,198) in view of Landau et al. (U.S. Patent

6,529,207 B1).

In reference to claims 1 and 9, Takeda et al. discloses a method and apparatus for

simulating three-dimensional objects using polygon data where an input polygon is determined

to be either front or back facing (see lines 1-2 and 7-10 of abstract). Takeda et al. discloses

sorting three-dimensional viewpoint coordinates, that have at least three vertices, making up

objects such as a race car and a race track (see columns 16-17, lines 66-10 and #226 of Figure

17B). Takeda et al. also discloses setting a back determination flag depending upon the

orientation of polygon vertex coordinates (see column 8, lines 46-65). Note the office interprets the back determination flag substantially similar to applicant's orientation decision variable. Although Takeda et al. discloses calculating a vector product of vertex coordinates (see column 8, lines 62-63), Takeda et al. does not explicitly disclose calculating a cross product term of a polygon however Landau et al. does. Landau et al. discloses a system used to identify objects to apply anti-aliasing determining whether a first primitive edge is hidden by other primitive edges (see lines 1-6 and 15-19 of abstract). Landau et al. discloses implementing back-face culling by computing an area of a triangle by the cross-product of the x and y projections of the triangle sides (see columns 5-6, lines 67-3). Landau et al. does not explicitly disclose calculating the cross-product term after having sorted the polygon data however it would have been obvious to one of ordinary skill in the art at the time the invention was made to sort the data before computing a cross-product term on the data in order to ensure the order of processing and polygon data remain constant making certain cross-product calculations will not yield incorrect signed data, which would ultimately lead to an incorrect determination of whether the polygon needs to be culled. It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the three-dimensional graphics simulation system of Takeda et al. with the back-face culling system of Landau et al. in order to render only front-face polygons reducing the amount of computation processing necessary for image synthesis (see column 2, lines 2-8 of Takeda et al.).

In reference to claims 2 and 10, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 1 and 9 respectively above in addition, Landau et al. discloses determining the sign of the cross-product calculation (see column 6, lines 3-11).

In reference to claims 3 and 11, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 2 and 10 respectively above in addition, Landau et al. discloses evaluating the sign of the cross-product calculation to determine whether to cull the polygons prior to rendering (see column 6, lines 3-26). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the back determination flag of Takeda et al. in conjunction with the sign evaluation disclosed by Landau et al. to determine whether culling is needed in order to compare polygons in all directions, utilizing the back determination flag to evaluate a Z direction (see column 8, lines 46-65 of Takeda et al.) and the sign of a cross-product calculation to evaluate X and Y directions (see columns 5-6, lines 67-12 of Landau et al.), when performing back-face culling.

In reference to claims 4 and 12, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 3 and 11 respectively above in addition, Landau et al. discloses comparing the sign of a cross-product calculation, indicating the direction of rendering, to an actual orientation or direction of a polygon (see column 6, lines 3-11).

In reference to claims 5, 13, 23 and 32, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 1, 9, 17 and 26 respectively. Landau et al. discloses using the cross-product calculation to determine the direction of rendering of the triangle or whether the triangle should be culled (see column 6, lines 3-27). Note the office interprets the determining of whether the triangle should or should not be culled to be substantially similar to an appearance characteristic as claimed by the applicant as one characteristic of an image is whether it is visible or not.

In reference to claims 6 and 14, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 1 and 9 respectively above. Neither Takeda et al. nor Landau et al. explicitly disclose sorting and generating an orientation decision variable substantially concurrently however the office believes such a limitation to be a matter of design choice as preferred by the designer. Further, the generating of the orientation decision variable may be executed following the sorting of polygon vertices, as the variable depends upon sorted vertex positions (see claim 7) therefore, the exact timing of concurrently sorting and generating provides no criticality to the system, as seen by the office, when viewing the system as a whole, as the system must wait for at least some vertices to be sorted in order to generate an accurate orientation decision variable.

In reference to claims 7 and 15, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 1 and 9 respectively above. Neither Takeda et al. nor Landau et al. explicitly disclose generating the orientation decision variable based on the sorted polygon data however it would have been obvious to one of ordinary skill in the art at the time the invention was made base the orientation decision variable upon sorted data in order to ensure the orientation decision variable represents an accurate/sorted orientation of the polygon vertices to be decided for culling.

In reference to claims 8 and 16, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 7 and 15 respectively above in addition, Landau et al. discloses setting an orientation flag indicating the direction of a polygon, determined from the sign of a cross-product calculation and an actual orientation of the polygon (see column 6, lines 3-27).

In reference to claims 17 and 26, Takeda et al. discloses a method and apparatus for simulating three-dimensional objects using polygon data where an input polygon is determined to be either front or back facing (see lines 1-2 and 7-10 of abstract). Takeda et al. discloses sorting three-dimensional viewpoint coordinates, that have at least three vertices, making up objects such as a race car and a race track (see columns 16-17, lines 66-10 and #226 of Figure 17B) using a sorting logic block (see #226 of Figure 17B). Takeda et al. also discloses a back-and-front determination logic block used to generate a back determination flag which the office sees as substantially similar to applicant's orientation decision variable (see column 8, lines 46-50 and #408 of Figure 1A). Note the office interprets the back determination flag substantially similar to applicant's orientation decision variable. Although Takeda et al. discloses calculating a vector product of vertex coordinates (see column 8, lines 62-63), Takeda et al. does not explicitly disclose calculating a cross product term of a polygon however Landau et al. does. Landau et al. discloses a system used to identify objects to apply anti-aliasing determining whether a first primitive edge is hidden by other primitive edges (see lines 1-6 and 15-19 of abstract). Landau et al. discloses the back-face culling determination, which includes the cross-product calculation, to be executed by a culling module (see column 8, lines 47-50 and #164 of Figure 12). Landau et al. discloses implementing back-face culling by computing an area of a triangle by the cross-product of the x and y projections of the triangle sides (see columns 5-6, lines 67-3). Landau et al. does not explicitly disclose calculating the cross-product term after having sorted the polygon data however it would have been obvious to one of ordinary skill in the art at the time the invention was made to sort the data before computing a cross-product term on the data in order to ensure the order of processing and polygon data remain constant making

certain cross-product calculations will not yield incorrect signed data, which would ultimately

lead to an incorrect determination of whether the polygon needs to be culled. It would have been

obvious to one of ordinary skill in the art at the time the invention was made to implement the

three-dimensional graphics simulation system of Takeda et al. with the back-face culling system

of Landau et al. in order to render only front-face polygons reducing the amount of computation

processing necessary for image synthesis (see column 2, lines 2-8 of Takeda et al.).

In reference to claims 18 and 27, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claims 17 and 26 respectively above in addition, Takeda et al. discloses

the sorting and back-and-front determination logic blocks being under the control of a three-

dimensional graphics simulator which performs back-face culling (see lines 1-10 of abstract).

Landau et al. discloses the culling module being under the control of a graphics rendering system

which performs back-face culling (see column 5, lines 56-59). It would have been obvious to

one of ordinary skill in the art at the time the invention was made to implement the logic blocks

of Takeda et al. with the culling module of Landau et al. in order to reduce the amount of

computation processing necessary for image synthesis (see column 2, lines 2-8 of Takeda et al.).

In reference to claims 19 and 28, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claims 17 and 26 respectively above. Although Landau et al. discloses a

graphics rendering system comprising a processor which controls the culling module (see

column 3, lines 44-45 and Figure 12), neither Takeda et al. nor Landau et al. explicitly disclose

the logic blocks part of a computer processor however, the office sees such a limitation as a

matter of design choice as preferred by the designer. Further, it is well known in the art to

implement graphics processing, performing graphics manipulations including culling, in graphics processors/adapters.

In reference to claims 20 and 29, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 17 and 26 respectively above. Although Landau et al. discloses the third logic block, the culling module, to determine back-face culled triangles which includes determining the sign of the cross-product term (see columns 5-6, lines 67-27 and column 8, lines 25-28), neither Takeda et al. nor Landau et al. explicitly disclose a fourth logic block determining the sign of the cross-product term however, the office sees such a limitation as a matter of design choice as preferred by the designer. Further, creating a separate logic block to determine the sign of the cross-product calculation instead of incorporating the sign determination in the third logic block (cross-product calculation) provides no immediate criticality to the system when viewing it as a whole.

In reference to claims 21 and 30, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 20 and 26 respectively. Claims 21 and 30 are similar in scope to claim 4 and therefore are rejected under similar rationale in addition, neither Takeda et al. nor Landau et al. explicitly disclose a fifth logic block determining an orientation of a polygon based on the sign of the cross-product term and the orientation decision variable however, the office sees such a limitation as a matter of design choice as preferred by the designer. Further, creating a separate logic block to determine an orientation of a polygon instead of incorporating it into the third logic block (cross-product calculation) provides no immediate criticality to the system when viewing the system as a whole.

In reference to claims 22 and 31, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 21 and 30 respectively above. Claims 22 and 31 are similar in scope to claim 3 and therefore are rejected under similar rationale.

In reference to claims 24 and 33, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 17 and 26 respectively above. Claims 24 and 33 are similar in scope to claim 6 and therefore are rejected under similar rationale.

In reference to claims 25 and 34, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claims 17 and 26 respectively above. Neither Takeda et al. nor Landau et al. explicitly disclose the first and second logic circuits to comprise the same logic circuit however, the office sees such a limitation as a matter of design choice as preferred by the designer. Further, the exact configuration of hardware within the system provides no immediate criticality towards the system as it is view as a whole. Also, it is well known in the art to incorporate several logic blocks together on a single chip, for example, to same physical space for other hardware.

In reference to claim 49, Takeda et al. discloses a method and apparatus for simulating three-dimensional objects using polygon data where an input polygon is determined to be either front or back facing (see lines 1-2 and 7-10 of abstract). Takeda et al. discloses sorting three-dimensional viewpoint coordinates, that have at least three vertices, making up objects such as a race car and a race track (see columns 16-17, lines 66-10 and #226 of Figure 17B). Takeda et al. also discloses setting a back determination flag depending upon the orientation of polygon vertex coordinates (see column 8, lines 46-65). Note the office interprets the back determination flag substantially similar to applicant's orientation decision variable. Although Takeda et al.

discloses calculating a vector product of vertex coordinates (see column 8, lines 62-63), Takeda et al. does not explicitly disclose calculating a cross product term of a polygon however Landau et al. does. Landau et al. discloses a system used to identify objects to apply anti-aliasing determining whether a first primitive edge is hidden by other primitive edges (see lines 1-6 and 15-19 of abstract). Landau et al. discloses implementing back-face culling by computing an area of a triangle by the cross-product of the x and y projections of the triangle sides (see columns 5-6, lines 67-3). Landau et al. does not explicitly disclose determining whether the polygon is front or back facing based on a sorted order of vertices however, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine if culling was needed based upon sorted polygon data in order to perform an accurate evaluation of the position of vertices when comparing the sign of the cross product calculation found using the polygon vertex data. It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the three-dimensional graphics simulation system of Takeda et al. with the back-face culling system of Landau et al. in order to render only front-face polygons reducing the amount of computation processing necessary for image synthesis (see column 2, lines 2-8 of Takeda et al.).

In reference to claim 50, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claim 49 above in addition, Takeda et al. discloses sorting polygon viewpoint coordinates in the Z-axis direction (see column 17, lines 4-10).

In reference to claim 53, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claim 49 above. Claim 53 is similar in scope to claim 7 and therefore is rejected under similar rationale.

In reference to claim 54 Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claim 53 above. Claim 54 is similar in scope to claim 6 and therefore is rejected under similar rationale.

In reference to claim 55, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claim 53 above. Neither Takeda et al. nor Landau et al. explicitly disclose generating an orientation decision variable following sorting the polygon data however the office believes such a limitation to be a matter of design choice as preferred by the designer. Further, the generating of the orientation decision variable may be executed following the sorting of polygon vertices, as the variable depends upon sorted vertex positions (see claim 7) therefore, the exact timing of sorting and generating provides no criticality to the system, as seen by the office, when viewing the system as a whole, as the system must wait for at least some vertices to be sorted in order to generate an accurate orientation decision variable.

In reference to claim 57, Takeda et al. and Landau et al. disclose all of the claim limitations as applied to claim 49 above in addition, Landau et al. discloses determining whether a polygon is back-face culled by evaluating the orientation (clockwise or counterclockwise) of the polygon to an actual orientation of the polygon (see columns 5-6, 67-27).

3.   Claims 35-38, 40-47, 51, 52, 59-66 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeda et al. (U.S. Patent 5,748,198), Landau et al. (U.S. Patent 6,529,207 B1) and further in view of Baltaretu et al. (U.S. Patent 6,437,780 B1).

In reference to claim 35, Takeda et al. discloses a method and apparatus for simulating three-dimensional objects using polygon data where an input polygon is determined to be either front or back facing (see lines 1-2 and 7-10 of abstract). Takeda et al. discloses sorting three-

dimensional viewpoint coordinates, that have at least three vertices, making up objects such as a

race car and a race track (see columns 16-17, lines 66-10 and #226 of Figure 17B). Takeda et al.

also discloses setting a back determination flag depending upon the orientation of polygon vertex

coordinates (see column 8, lines 46-65). Note the office interprets the back determination flag

substantially similar to applicant's orientation decision variable. Although Takeda et al.

discloses calculating a vector product of vertex coordinates (see column 8, lines 62-63), Takeda

et al. does not explicitly disclose calculating a cross product term of a polygon however Landau

et al. does. Landau et al. discloses a system used to identify objects to apply anti-aliasing

determining whether a first primitive edge is hidden by other primitive edges (see lines 1-6 and

15-19 of abstract). Landau et al. discloses implementing back-face culling by computing an area

of a triangle by the cross-product of the x and y projections of the triangle sides (see columns 5-

6, lines 67-3). Neither Takeda et al. nor Landau et al. explicitly disclose determining positional

differences between adjacent vertices of a polygon however Baltaretu et al. does. Baltaretu et al.

discloses a graphics system wherein rectangular areas are determined covered by polygons (see

column 2, lines 57-61). Baltaretu et al. discloses a delta calculator within a vertex tiler that

computes the differences between x and y coordinates of three adjacent vertices of a polygon

(see column 17, lines 20-24). Baltaretu et al. also discloses sorting the vertices before

calculating positional differences between the vertices (see #311 (sorting function) and #322

(positional difference function) of Figure 3C and #322 and #370 of Figure 3D). It would have

been obvious to one of ordinary skill in the art at the time the invention was made to implement

the three-dimensional graphics simulation system of Takeda et al. and the back-face culling

system of Landau et al. with the positional difference calculation and sorting of graphics data in

order to better determine if the vertices were received, by the rendering system, in a certain order

by sorting the vertices eliminating the need to check for culling located outside the projection of

the polygon in the scanning direction (see columns 9-10, lines 65-1 of Baltaretu et al.).

In reference to claim 36, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 35 above in addition, Landau et al. discloses utilizing the

positional differences in a vertex-to-tile translator which converts vertex coordinates to create

tiles (see column 18, lines 25-47). Note the office interprets the formation of tiles from vertex

coordinates an alternate rendering operation.

In reference to claim 37, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 35 above. Claim 37 is similar in scope to claim 2 and

therefore is rejected under similar rationale.

In reference to claim 38, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 37 above in addition, Baltaretu et al. discloses evaluating

the sign of a cross-product calculation based on sorted data (see column 17, lines 28-35 and #311

and 331 of Figure 3C).

In reference to claim 40, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 38 above in addition, Landau et al. discloses comparing the

sign of the cross-product calculation with an actual orientation of a triangle leaving the sign of

the cross product calculation unchanged (see column 6, lines 3-27).

In reference to claim 41, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 37 above in addition, Landau et al. discloses comparing the

sign of the cross product calculation with an actual orientation of a triangle to see if the rendering orientation of the triangle has been changed (see column 6, lines 3-27).

In reference to claim 42, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 35 above in addition, Takeda et al. discloses sorting polygon viewpoint coordinates in the Z-axis direction (see column 17, lines 4-10).

In reference to claim 43, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 42 above in addition, Baltaretu et al. discloses sorting the vertices of polygons from top to bottom, comparing y coordinate delta values (see column 18, lines 15-25).

In reference to claim 44, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 43 above in addition, Baltaretu et al. discloses sorting the vertices of polygons from left to right, comparing x coordinates (see column 17, lines 47-56).

In reference to claim 45, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 35 above. Takeda et al. also discloses setting a back determination flag depending upon the orientation of polygon vertex coordinates (see column 8, lines 46-65). Note the office interprets the back determination flag substantially similar to applicant's orientation decision variable.

In reference to claim 46, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 45 above. Claim 46 is similar in scope to claim 6 and therefore is rejected under similar rationale.

In reference to claim 47, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 45 above. Neither Takeda et al., Landau et al. nor Baltaretu

et al. explicitly disclose generating an orientation decision variable following sorting the polygon

data however the office believes such a limitation to be a matter of design choice as preferred by

the designer. Further, the generating of the orientation decision variable may be executed

following the sorting of polygon vertices, as the variable depends upon sorted vertex positions

(see claim 7) therefore, the exact timing of sorting and generating provides no criticality to the

system, as seen by the office, when viewing the system as a whole, as the system must wait for at

least some vertices to be sorted in order to generate an accurate orientation decision variable.

In reference to claim 51, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the

claim limitations as applied to claim 50. Neither Takeda et al. nor Landau et al. explicitly

disclose sorting the polygon data based on horizontal positions however Baltaretu et al. does.

Baltaretu et al. discloses sorting the vertices of polygons from top to bottom, comparing y

coordinate delta values (see column 18, lines 15-25). It would have been obvious to one of

ordinary skill in the art at the time the invention was made to sort the polygon data in order to

better determine if the vertices were received, by the rendering system, in a certain order by

sorting the vertices eliminating the need to check for culling located outside the projection of the

polygon in the scanning direction (see columns 9-10, lines 65-1 of Baltaretu et al.).

In reference to claim 52, Takeda et al. and Landau et al. disclose all of the claim

limitations as applied to claim 51 above. Neither Takeda et al. nor Landau et al. explicitly

disclose sorting the polygon data based on horizontal positions however Baltaretu et al. does.

Baltaretu et al. discloses sorting the vertices of polygons from left to right, comparing x

coordinates (see column 17, lines 47-56). It would have been obvious to one of ordinary skill in

the art at the time the invention was made to sort the polygon data in order to better determine if

the vertices were received, by the rendering system, in a certain order by sorting the vertices eliminating the need to check for culling located outside the projection of the polygon in the scanning direction (see columns 9-10, lines 65-1 of Baltaretu et al.).

In reference to claim 59, claim 59 is similar in scope to claim 35 and therefore is rejected under similar rationale in addition, Landau et al. also discloses back-face culling polygons based upon a comparison of the sign of a cross-product calculation and an actual orientation of a polygon to see if both indicate a common orientation (clockwise and counterclockwise) (see columns 5-6, lines 67-27).

In reference to claim 60, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 59 above. Landau et al. discloses determining whether a polygon is back-face culled by evaluating the orientation (clockwise or counterclockwise) of the polygon to an actual orientation of the polygon (see columns 5-6, 67-27).

In reference to claim 61, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 60 above. Landau et al. discloses determining whether a polygon is back-face culled by evaluating the orientation (clockwise or counterclockwise) of the polygon to an actual orientation of the polygon to see if they indicate a common or opposite orientation (see columns 5-6, 67-27).

In reference to claim 62, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 61 above. Claim 62 is similar in scope to claim 43 and therefore is rejected under similar rationale.

In reference to claim 63, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 62 above. Claim 63 is similar in scope to claim 44 and therefore is rejected under similar rationale.

In reference to claim 64, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 59 above. Takeda et al. also discloses setting a back determination flag depending upon the orientation of polygon vertex coordinates (see column 8, lines 46-65). Note the office interprets the back determination flag substantially similar to applicant's orientation decision variable.

In reference to claim 65, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 64 above. Neither Takeda et al., Landau et al. nor Baltaretu et al. explicitly disclose calculating a cross-product term based on the sorted polygon data however it would have been obvious to one of ordinary skill in the art at the time the invention was made to base the cross-product calculation upon sorted data in order to ensure the yield of the calculation represents an accurate orientation of the polygon vertices to be decided for culling since the determination of whether to cull is based, in part, upon the sign of the cross-product calculation.

In reference to claim 66, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 65 above. Claim 66 is similar in scope to claim 2 and therefore is rejected under similar rationale.

In reference to claim 68, Takeda et al., Landau et al. and Baltaretu et al. disclose all of the claim limitations as applied to claim 59 above. Claim 68 is similar in scope to claim 5 and therefore is rejected under similar rationale.

Allowable Subject Matter

4.   Claims 39, 48, 56, 58 and 67 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In reference to claim 39, the prior art of record (Takeda et al. (U.S. Patent 5,748,198), Landau et al. (U.S. Patent 6,529,207 B1) and Baltaretu et al. (U.S. Patent 6,437,780 B1)) does not disclose changing the sign of a cross-product term in combination with further claim limitations of claim 38 from which claim 39 claims dependency.

In reference to claim 48, the prior art of record (Takeda et al. (U.S. Patent 5,748,198), Landau et al. (U.S. Patent 6,529,207 B1) and Baltaretu et al. (U.S. Patent 6,437,780 B1)) does not disclose evaluating the orientation decision variable when evaluating the sorted order of polygon data in combination with further claim limitations of claim 45 from which claim 48 claims dependency.

In reference to claim 56, the prior art of record (Takeda et al. (U.S. Patent 5,748,198), Landau et al. (U.S. Patent 6,529,207 B1) and Baltaretu et al. (U.S. Patent 6,437,780 B1)) does not disclose determining whether a polygon is front or back facing based at least in part on the sorted order of at least three vertices comprises considering the orientation decision variable, in combination with further claim limitations as of claim 53 from which claim 56 claims dependency.

In reference to claim 58, claim 58 is objected to as being dependent upon objected claim 56 from which claim 58 claims dependency.

In reference to claim 67, the prior art of record (Takeda et al. (U.S. Patent 5,748,198),

Landau et al. (U.S. Patent 6,529,207 B1) and Baltaretu et al. (U.S. Patent 6,437,780 B1)) does

not disclose determining whether a polygon's orientation has changed evaluating the sign of a

cross-product calculation and an orientation decision variable, in combination with further claim

limitations of claim 66 from which claim 67 claims dependency.

References Cited

5.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure:

a.   Harris et al. (U.S. Patent 6,304,265 B1)

  • Harris et al. discloses a method and apparatus for determining between

    front and back facing polygons.

b.   Aleksicy (U.S. Patent 5,977,980)

  • Aleksicy discloses a method and apparatus for determining visibility of a

    pixel during video rendering using z-positioning information of an object

    element.

c.   Deolaliker (U.S. Patent 5,898,437)

  • Deolaliker discloses a graphics display system using face determination

    for presorting a list of triangles from an image file.

d.   Ashburn (U.S. Patent 5,651,106)

  • Ashburn discloses sorting polygon vertices in a graphics system.

e.   "Backface Culling Snags", James F. Blinn. Nov. 1993. IEEE Computer Graphics.

- Blinn discloses some problems in one common implementation of

  backface culling.

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Antonio Caschera whose telephone number is (703) 305-1391.

The examiner can normally be reached Monday-Thursday and alternate Fridays between 7:00

AM and 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Joseph Mancuso, can be reached at (703)-305-3885.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive,

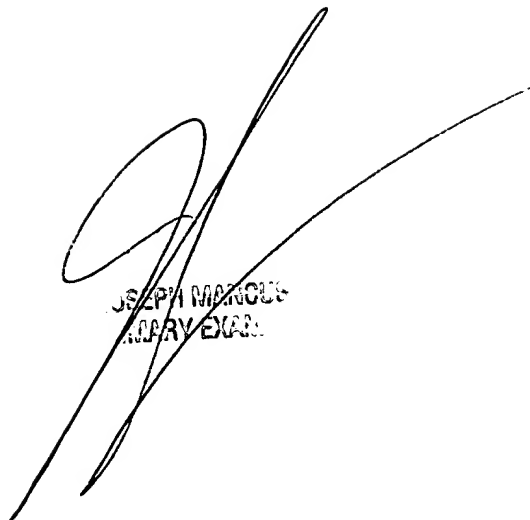Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the Technology Center 2600 Customer Service Office whose telephone

number is (703) 306-0377.

aac

5/29/03

JOSEPH MANCUSO
PRIMARY EXAMINER